POLYGAMY AND OTHER MODES OF MATING AMONG BIRDS

R. W. SHUFELDT

For several years I have devoted much time to a study of the phenomena of sex in vertebrates, comparing those of the lower forms with the features presented by man. Much of the matter thus obtained is now in the publisher's hands but some of it is presented here.

The nature of man, his customs, habits, and institutions, his mental and physical characteristics cannot be fully and intelligently understood unless all of our stock of accumulated facts are studied in the light of what we know to obtain along the corresponding lines among all animals below man. That is to say, it is simply impossible to comprehend the morphology of man, unless our studies of it are made comparative with our knowledge of the anatomy of all other animals. So too with all else manifested on the part of our species;— to get at the origin of all things in man and his customs, his crimes, and his passions, we are obliged to trace them down through the scale of living forms below him. It holds in our researches into the science of society, and it was Letourneau who said "When once it is established that man is a mammal like any other, and only distinguished from the animals of this class by a greater cerebral development, all study of human sociology must logically be preceded by a corresponding study of animal sociology. Moreover, as sociology finally depends on biology, it will be necessary to seek in physiological conditions themselves the origin of great sociological manifestations." [1]

It has been recently, with such thoughts as these in mind, that I have been making some comparisons of the various forms of marriage as we find it among different races of mankind; the question of divorce; and the part played in the marital relations by sexuality. Following the biological methods of comparison

[1] The Evolution of Marriage, p. 2, 1900.

and derivation, I attempted to bring together what I knew of the matter of mating among animals generally, carrying my investigations into the various groups of fishes, reptiles, birds and mammals. It is a very well known fact that with respect to our own species, we meet in one part of the world or another, people who practice every form of sexual relation, to say nothing of what is met with along the lines of pervertism in such matters. Even in the United States, we meet with any number of cases of marriage devoid of all ceremony (anarchists); of free love; of monogamy; of promiscuity; of polygamy and bigamy; of legalized concubinage (South Carolina); and of the divers unnatural relations of the sexual perverts and inverts. Polyandry, that rare and exceptional conjugal form, where the one wife has two or more husbands, has never been instanced among us, so far as I am aware. No such sexual association is met with among mammals below man, and never among birds.

It is in this latter class of vertebrates that we meet with some of the purest types of, as well as some of the most interesting examples of the conjugal relation, and it is to a comparative consideration of some of these that the present article will be devoted.

In reviewing the material for this purpose at hand, I have drawn largely upon my own ornithological observations and studies extending over a period of forty or more years. Then I have consulted such works upon ornithology as I find in my private library. With respect to the latter, I am obliged to confess my surprise at the inadequacy of the accounts, and the marked variance often exemplified in the statements of different authors of recognized standing and reputation on the subject. Very few books at my command pretend to make any comparisons between the mating habits of birds and the marriage customs of various peoples, but there are a few.

Beyond the matter of the different procedures of courtship in the case of birds, there are no further ceremonials with them as in the case of many, indeed, the majority of the races of mankind. So that, in the abstract, polygamy in birds means exactly the same thing as human polygamy, and so on for monogamy, promiscuity and other practices. Taken in the abstract, and barring opinions to the contrary, many believe in the case of man, that

in prehistoric time, when he was first differentiated from simian stock, he, wherever existing, was given over to unmixed promiscuity; that this was soon followed in many regions by some form of polygamy, and polyandry where women were scarce (rare); as promiscuity disappeared, and polygamy became far less prevalent, some mode of monogamy appeared, and this, at the present time is the form of marriage adopted by nearly all civilized races. In other words these various customs have shaded into each other, —that is, in the main, promiscuity for the wild, prehistoric people; followed by polygamy for ancient times, with monogamy now ever on the increase. Still we must bear well in mind that we have polygamy now openly followed in the United States, and some of the lowest existing races of the world are monogamous.

These facts are thus briefly presented in that we may contrast them with what occurs in the class of birds. Theoretically, in one way, the lowest forms of existing birds should in their mating be given over to promiscuity; those higher in the scale should be polygamous; and, finally the most specialized types, as the Passeres, be monogamous. This, however, is by no means the case, and agreeing with our own species, some of the existing groups of birds most nearly related to extinct types, closely associated with reptilian stock, are strictly monogamous, while others perhaps, are promiscuous (no birds being polyandrous); and still others affording examples of polygamy. So it is too, higher up in the scale, just as it is, as before remarked, with the human species.

Tracing birds back through geologic time as best we can by means of the material at hand there is no question but what in their morphology they approached nearer and nearer the archaic types of reptiles. Avian and reptilian osteology especially emphasizes this fact, and it is well known that some of the existing families of birds from various parts of the world exhibit in their skeletons characters that were more or less common to the entire class Aves as represented in that age of the Earth's history when birds had first become more or less differentiated from their reptilian ancestry. This by no means implies, however, that the present day existing families of birds, in the osseous systems of which still are to be met with those more pronounced evidences (in the

way of characters) of their reptilian relationships, are distinctly more closely allied upon that account. Many taxonomers, however, have thought so; and have endeavored to show that all existing true ostrich forms, the Kiwis, and tinanous are a sort of modern affined struthious types. On the other hand a Kiwi (Apteryx) is no nearer an ostrich, and an ostrich to a tinamou, than a limpkin (Aramus) is to a bustard, and a bustard (Otis) to a quail (Colinus). Therefore it need not surprise us, in view of all that has been set forth above, that the various modes of mating of any of these birds should be entirely different, or that these modes should fail to throw any light upon their affinities. For a moment then let us see what some authors have to say in regard to the mating of ostriches and their allies.

Professor Newton, quoting Lichtenstein, says: "Though sometimes assembling with Zebras or with some of the larger antelopes, ostrichs commonly, and especially in the breeding season, live in companies of not more than four or five, one of which is a cock and the rest are hens. All the latter lay their eggs in one and the same nest, a shallow pit scraped out by their feet, with the earth heaped around to form a kind of wall against which the outermost circle of eggs rest. As soon as ten or a dozen eggs are laid, the cock begins to brood, always taking his place on them at nightfall surrounded by his wives, while by day they relieve one another, more it would seem to guard their common treasure from jackals and small beasts-of-prey than directly to forward the process of hatching, for that is often left wholly to the sun."[1] From this it is clear that the African Ostrich is a polygamous bird by nature.

The Rhea or South American ostrich (*Rhea darwini, americana*, etc.) is also undoubtedly polygamous in nature, while the emeus of Australia are said to be monogamous, though neither Newton or Pycraft[2] say anything on this point. Neither do they give us any information on this point in regard to the cassowaries, birds

[1] Newton, Alfred. *A. Dictionary of Birds.* Part III, Art. "Ostrich," pp. 664–665, 1894, quoted from M. H. K. Lichtenstein, *Reise im südlichen Africa*, ii, pp. 42–45 (Berlin: 1812.). The fact that the sun assists in hatching the eggs of the African ostrich is disputed, but it is doubtless true. Captive ostriches are usually enforced to lead a life of obligatory monogamy.

[2] Pycraft, W. P. *The Living Animals of the World.* Vol. II, p. 394, London (no date).

more or less closely allied to the emeus. Indeed, I am unable to state whether a cassowary is, by nature, polygamous or monogamous. Their eggs have been described but apparently not their mating habits. None of the above-named writers describe the breeding habits of the kiwis (*Apteryx oweni, mantelli* and *australis*) and I am unable from personal observation to state whether they are by habit monogamous or polygamous (see Sir Walter Buller, Newton, Pycraft, and other writers). These curious birds, now being rapidly exterminated, are probably monogamous, as Dr. Claus says of them, "The kiwis are nocturnal birds, which by day remain concealed in holes in the earth and go out at night to seek their food. They feed on insect-larvæ and worms, live in pairs, and at the breeding time, which seems to come twice in the year, they lay, in holes scraped in the earth, a strikingly large egg, which, according to some, is incubated by the female, and according to others by the male and female in turn." [1]

So far as I have been able to ascertain, the tinamous (Crypturidæ) are monogamous birds, while they associate together in flocks during those times of the year when they are not breeding. Newton does not mention this in the "Dictionary," and at this writing I do not happen to have Bartlett's paper at hand (P. Z. S. 1868, p. 115, pl. xii). In fact there are but very few good accounts of the breeding habits of these very interesting birds. Their wonderfully beautiful eggs are well-known to naturalists,

All water birds of the main groups appear to be monogamous in the matter of their mating. There appear to be no exceptions to this rule to be met with among the several suborders of the Pygopodes, Impennes, Tubinares, Steganopodes, Longipennes, Alcæ, and the Chionides. As we know, these groups contain the divers, the penguins, the petrels, the pelicans and various allies, the gulls, and the auk tribe. Nearly all these forms are low in the scale, and in all we meet with near relatives among birds that are extinct and certain fossil types. Yet, as I say, they are all monogamous so far as my knowledge carries me. Passing next to the great limicoline assemblage (Limicolæ), it is to be observed that it contains, with their numerous allies, the

[1] Claus, Dr. C. Elementary Text-book of Zoology. Translated by Sedgwick and Heathcote. Pt. ii, p. 272, 1885.

plovers, the turnstones, the surf birds, the snipes, the phalaropes, the avocets, and the jaçanas, the entire host being monogamous by habit, with but one famous exception, namely, the truly polygamous ruff (*Machetes pugnax*). The peculiar habits of courtship and breeding practiced by this species have been well-described by a number of continental naturalists.[1] Among the Limicolæ there appears to be, among existing birds, but one other species suspected of being a polygamist, and this is the double or solitary snipe (*Scolopax major*) of Europe. Newton does not mention the fact in the "Dictionary," but Darwin remarks in "The Descent of Man," that "some of the above birds,— the black-cock, capercailzie, pheasant-grouse, ruff, solitary snipe, and perhaps others, are, as is believed, polygamists." (p. 406.) From all that I can gather, it would seem that the question has not yet been decided. Coming to the Cursoræ, the group contains but few species that I know of, that have been suspected of being polygamists and among these is the great bustard (*Otis tarda*),— and with it most of the evidence seems rather to point to the fact, that such is the case. Whether any other representatives of this somewhat numerous group (Europe, Africa, Asia, and Australia) are polygamous by habit, I am unable at present to say. However, the birds called 'floricans' of India, closely allied species to the bustards, are reported as practising polygamy. There seem to be two known species of these, — the Bengal (*Sypheotides bengalensis*) and the lesser florican (*S. aurita*). During pairing season the two sexes live apart in groups, and in mating come together, and "when a male wishes to attract a temporary partner, he does so by going through an elaborate series of performances."[2] It is possible that all the true bustards possess strong inclinations in this direction, even if they are not actually polygamists. Not so, however, with the stone curlew (*Œ. crepitans*) a species I have relegated to the Cursoræ, although, I by no means consider it to be very closely allied to the Otididæ.[3]

[1] See A. Newton, art. "Ruff." Dict. Birds, Darwin, "The Descent of Man," p. 219, Montagu (*Suppl. Orn. Dict.* 1813); Pennant, Daniel, Graves, Collett, Lubbock, Southwell, Stevenson and others.

[2] Lydekker, R. *The Royal Nat. Hist.* p. 458.

[3] Shufeldt, R. W. "An Arrangement of the Families and the Higher Groups of Birds." *The Amer. Nat.*, Vol. **38**, Nov., Dec., 1904, pp. 833–857.

Monogamous matings seem to be the rule with all the cranes and rails, with their allies, near and remote.[1]

Probably no group of birds in the world's entire avifauna have been more closely studied or had more written about them than the great gallinaceous group of fowls, including among them not a few other such familiar birds as the turkeys, the guinea fowls, quails, partridges, grouse, pheasants, and their various allies, near and remote. Good and sufficient reasons there are for this, as a very large number of them are, and have been, long domesticated, as the chickens and turkeys. All of them constitute game in every part of the world; while many of them are kept in zoological gardens and private preserves, as the pheasants and others. None of the Galliformes, I believe, are polyandrous, though many of the families are curiously divided up between polygamy and monogamy, some being strong adherents of the first-named practice, while others, under no circumstances, depart from the latter mode of mating.

Captivity sometimes influences these habits, and birds that are polygamous in nature become monogamous when their domestication is undertaken, and *vice versa*. Beautiful accounts have been given us by different naturalists of the often extraordinary courtships to be seen in the case of many of the representatives of this suborder of birds, while in other cases there habits are still quite unknown to science. Whether the Hemipodes or button quails (Hemipodidæ) are polygamous or not, I cannot at this writing say, but it is a well known fact that with them the females are brighter plumaged while the males, resembling the subadult specimens, perform all the duties of incubation. All this is

[1] *Loc. cit.* pp. 851, 852. It is here intended to include the supersuborders Gruiformes and Ralliformes. Curious and puzzling forms of birds occur in the first assemblage (Grues) such as the trumpeters (Psophia), the seriema (Cariama), the sun-bitterns (Eurypyga), the kagu (Rhinochetus), and the Mesitidæ of Madagascar. Although many of these have been long known to ornithologists, and much written about them, it is by no means certain that they are all monogamous species in nature, as I believe the finfoot (Heliornis) among the Ralliformes to be. Several of those named have been kept in zoölogical gardens, where they have reared their young, but a bird may be monogamous in captivity and polygamous in nature. Both the sun-bitterns and the kagu practice a show-off, but it does not appear to be confined to the breeding season or to their modes of courtship.

reversed in the little common quail of the old world (*Corturnix communis*), a well-known polygamous species, where the males are both larger and handsomer than the females.

As to the Megapodes or brush turkeys (Megapodidæ) of the East Indies and Australia, none of the writers at hand state whether they are polygamous or otherwise.

The habits of these birds are pretty well known, especially their burying their eggs in immense mounds which they build, or concealing them in sand-holes and burrows, in either situation they hatch out by the sun and the heat of the fermenting vegetable matter in the mounds. The young fly an hour after they are hatched. Wallace describes several species of them in his "Malay Archepelago," but does not state whether they are polygamous or not, and neither Newton or Pycraft have anything to say upon that point.[1]

Most ornithological writers lay it down as a rule that among the Gallinæ generally, where the cock bird is evidently larger than the hen and its plumage is remarkably conspicuous, the hen, being more or less plain in this particular, the species is polygamous, whereas, when the sexes are nearly alike in point of size, and but little difference in plumage, they are almost certain to be monogamous in their mating. There are, however, a few exceptions to this rule.

Personally, I have never studied the curassows and guans (*Cracidæ*) in their native haunts, and therefore cannot say, from my own experience, anything in regard to their mating habits. In this group, I take it, the curassows of South America are probably monogamous, as is likewise our Chachalaca (*Ortalis v. maccalli*), though in the case of the latter species, where the sexes are nearly alike, few American ornithologists describe its courtship and mating, notably Bendire, Coues, Ridgway (Manual), and others, while continental writers rarely refer to it. Neither Audubon or Wilson ever saw the bird.

Finally, the suborder Gallinæ is seen to contain five very ele-

[1] *Loc. cit.* Art. "Megapode" Pt. ii, p. 539, and Pycraft, "Living Animals of the World" Lond. p. 411. One writer states that several hen megapodes may bury their eggs in the same mound, but does not say whether the birds all belonged to the harem of one male.

gant families of birds, representatives of which, in more or fewer species, are found in all parts of the world. These are the pheasants (Phasianidæ), the grouse (Tetraonidæ), the American Partridges (Odontophoridæ), the Guinea fowl (Numididæ), and the Turkeys (Meleagridæ). Great is the wealth of species in the most of these several families, and while some of them are polygamous, others are strictly monogamous, and the habits of any of them may be changed through domestication, and they sometimes infringe upon, or even break, some of the rules given in foregoing paragraphs. Included in their ranks are all of our common domesticated gallinaceous fowl, and occasionally the habits of some of these are very remarkable.

Very much do I regret that I cannot give more space to this group as it is both an interesting as well as an important one; moreover, authors are by no means unanimous in their opinions in regard to the modes of mating, and in the case of some species we have apparently no data at all. Considerable part of the literature has been carefully looked up by me. No one seems to question but what such species as the capercailie and black grouse of northern Europe are polygamous. Pheasants and their near allies are likewise so, and I believe the famous Argus pheasant is, but in this I may be wrong. The wild turkeys of North America are also polygamists, though it is said that the old males generally have a favorite hen,while the other females he favors are but his concubines. Peacocks are polygamous but the various species of Guinea fowl are eminently monogamous. When the latter are domesticated, however, as vast numbers of them are, I have personally known a male Guinea fowl to take charge of six or seven hens, and the latter would all lay the usual number of eggs and bring forth their young. From all I can gather, it has been found that all the species of ptarmigan wherever they occur are monogamous. This seems to be the case too, with the birds we call quail (American partridges: Odontophoridæ), though I am not so sure about the species of the genus Cyrtonyx. The common partridge of Europe is monogamous, as are the majority of our typical grouse (Canada, dusky, Franklin's and others), the sage cock, however, is polygamous (Centrocercus).

Audubon, whose life-histories of our game birds are so thorough-

ly unsatisfactory, in his account of the mating of the pinnated grouse (Tympanuchus) gives one the impression that he believes the bird to be monogamous, while in his account of the ruffed grouse (Bonasa) he states in referring to the latter species, that "The males have the liberty of promiscuous concubinage, although not to such an extent as those of the pinnated grouse."[1] Bendire, on the other hand when describing the habits of the ruffed grouse (*B. umbellus*) says, "By many persons the ruffed grouse is considered polygamous, and while I can not actually disprove that assertion, I doubt it very much."[2]

Again authors are at variance in their opinions with respect to the several species of the sharp-tailed grouse (Pediocætes) and E. T. Seton, quoted by Bendire, says of the prairie sharp-tailed grouse in describing the remarkable dance of the males, "Its erratic character can hardly be questioned.... The whole affair bears a close resemblance to the manœuvring of the European ruff, and from this and other reasons I am inclined to suspect the sharp-tail of polygamy."[3]

The curious hoatzin of tropical South America (Opisthocomus) in a way related to the Gallinæ, is said to be polygamous, but as yet we stand quite in ignorance of some of the habits of this interesting form in nature.

Sand-grouse (Syrrhaptes) and their kin I believe are monogamous, and I do not at this writing recall any species of wild pigeon (Columbiformes) that has any other form of mating in the breeding

[1] Audubon, J. J. Birds of America, Vol. V, pp. 78 and 93–105, 1839.

[2] Bendire, Chas. E. Life Hists. Amer. Birds, p. 61. In the same work (p. 90), and quoting Judge John Dean Caton, he evidently believes the pinnated grouse to be monogamous, when it is stated that "It is toward the latter part of the love season that the fighting takes place among the cocks, probably by two who have fallen in love with the same sweetheart, whose modesty prevents her from selecting between them."

[3] *Loc. cit.* p. 105. I am of the opinion that this question has by no means been definitely settled yet, except perhaps in the case of the ruffed grouse which has been kept and reared in confinement by Mr. C. F. Hodge who says "The cocks of the ruffed grouse are evidently polygamous. I observed the "wild" cock mate with the two "wild" hens. The hens, however, permitted mating but once, and after mating, if left together, the cock will pick the hen to death." (Rep. of the Comm. on Fisheries and Game. Dec. 31, 1905 [Mass.] Pub. Doc. No. 25, pp. 66, 67.

season, though to me pigeons are by no means always so. Those birds known as screamers (Palamedæ) also appear to be monogamous, and I believe the entire swan, goose and duck tribe (Anseriformes) are,— at least in nature, although there may be exceptions to this that I either do not recall for the moment, or have not come to my notice. When domesticated, however, ducks may become highly polygamous, and it is a well-known fact that in this state it is not difficult to cross various species and rear interesting hybrids. Cases of this character are reported by Darwin, who states with respect to birds that "In several groups I have not been able to discover whether the species are polygamous or monogamous."[1]

"Very peculiar fancies," says Letourneau, "sometimes arise in the brains of certain birds. Thus we see birds of distinct species pairing, and this even in a wild state. These illegitimate unions have been observed between geese and barnacle geese, and between black grouse and pheasants," and further, when quoting Hewitt from Darwin as to how a common tame mallard duck threw over the male of own species and deliberately courted a male pintail that had been placed in the water with her, mated, and would have nothing further to do with the mallard, he says "that conjugal fidelity does not always resist a strong impression arising from a chance encounter; that novelty has a disturbing effect; and, finally, that indifference and coldness can rarely hold out against the persistent advances of one who loves ardently enough not to yield to discouragement. Dante has already made this last reflection in his celebrated line —

'Amor ch'a null' amato amar perdona.'

To quote Dante *à propos* of the illicit amours of a pintail and a wild duck may shock the learned, but the aptness of the quotation proves once more the essential identity of the animal and human organisms."[2]

Polygamy is not practiced, so far as I am aware, by any of the flamingoes (Phœnicopteri), or representatives of the crane-stork assemblage (Herodiones), or the diurnal Raptores including all the vultures (Accipitres), or the parrot group (Psittaci), or

[1] *Loc. cit.* pp. 219, 218.

[2] Letourneau Ch. *The Evolution of Marriage.* London, 1900, pp. 28, 29.

the owls (Striges), the Caprimulgine forms (Caprimulgiformes). None of the Coraciæ (rollers, etc.) I believe are polygamous, or the kingfishers (Halcyoniformes), or the Bucerotes, or representatives of such suborders as the Upupæ, the Meropes, the Momoti, or the Todi, but when we come to the humming-birds (Trochili) some authorities still seem to be in doubt, and no less a distinguished ornithologist than Mr. Salvin told Darwin that he was "led to believe that humming-birds are polygamous," [1] but, the present writer by no means entertains any such an opinion.

Comparatively speaking, very little is known of the courtships and matings of the Jacamariformes (jacamars and puff-birds) and the Trogoniformes (trogons), but I believe none of them to be polygamous in their habits, although if found to be so it would in no way surprise me, on account of the relations of the latter to the cuckoos.

When I say this I do not mean to imply that any of the cuckoos are strictly polygamous, and no writer seems to be perfectly certain on that point. What the mating habits of the touracos (Musophagidæ) is like, I am, at this writing unable to say, but it is very interesting and important for us to know. Those who have had opportunity to study them have, as in so many instances in ornithological history, overlooked all this. The literature upon the nidification of the cuckoos (Cuculidæ) would make many volumes so it is quite unnecessary to dwell upon it here. Their depositing their eggs in the nest of other birds is simply parasitism, and for all I know to the contrary, the European cuckoo may be the veriest polygamist in the world's avifauna, and the same is true of others of his kin that follow the same practice. It is not likely that these birds are monogamous, it being far more probable that they follow some form of promiscuity, or where there is a scarcity of males, even polyandry? All these remarks likewise apply to our cowbirds (Molothrus) of the Passeriformes, birds which I am quite sure from personal observation may be either polygamous, monogamous, promiscuous, or have recourse to concubinage, or perchance in some instances, may even be polyandrous, though

[1] *Loc. cit.* p. 219. I have never seen any evidence of this in an common eastern form, the ruby-throat, nor in any of those I have had the opportunity to study in the west.

it is only through the force of circumstances that birds are ever the latter, as some seem to contend.

Some of the breeding habits of Cuckoos in various parts of the world are truly remarkable, as witness those of this country (Crotophaga, Geococcyx and Coccyzus). It would appear, from what we know of its habits, that our Anis may be strictly polygamous (Crotophaga), inasmuch as several females of this species all lay their eggs in the same nest,— but even so, they may be the mates of different males.

There are some wonderfully interesting questions that arise, when we come to study the courtships, mating, and nidification of the cuckoos, cuckoo-like birds, and the cowbirds, and especially when we apply this knowledge, in a comparative way, with the customs followed by our own species. Space, or rather its limitations, will not admit of my discussing any such matter here. Furthermore, the author is at present engaged upon a volume that will take fully into considerations all such questions, and where sufficient data is available, endeavor to throw some light upon their significance. Right here I may say, however, that the reader cannot be too strongly commended to read in the present connection all that Darwin has to say with respect to birds in *The Descent of Man* (pp. 219–221 and 358–499); also Letourneau on the *Evolution of Marriage.*

Returning to the cuckoos for a moment, I find Dr. R. Bowdler Sharp has said of the common European species (*C. canorus*), "There can scarcely be any doubt that the number of males considerably exceeds that of the females and some naturalists not only speak of the species as polyandrous but declare that the female bird does all the courting." They are said to lay twenty eggs in one season.[1]

Other than those referred to above, I know of few other birds in the world that are given to polygamy, though I expect the breeding habits of some of them are wonderfully interesting, not to say curious. Little or no information is before me on such subjects with respect to some of the following suborders, namely the Pamprodactylæ, Capitones, Rhamphastides, Indicatores, Piciformes,

[1] Cuckoos, Royal Nat. Hist. Lond., R. Lydekker, Editor. This work contains some excellent general accounts of birds and their habits.

Cypseliformes, and the Eurylæmiformes, although I know of no species or family among these several groups that are not strictly monogamous by nature, while they may differ very widely in their habits of nidification. Unfortunately, we still know very little about the life-histories of the lyre-birds of Australia (Menura), and some naturalists believe them to be polygamous. Again, Darwin quoting Lesson says "that birds of paradise, so remarkable for their sexual differences, are polygamous, but Mr. Wallace doubts whether he had sufficient evidence."[1]

In closing this article it is well to note that what I have set forth in it has probably long been known to the majority of general and observing naturalists of each generation, but not so to the average reading public, and, unfortunately not to a great many people to whom the knowledge would be of considerable interest if not of positive value.

It is clearly shown that birds, as a Class among Vertebrates, in nature may, in mating, be polygamists, monogamists, or under certain conditions given to practices simulating polyandry, or, as some claim, actual polyandry. At present we have no knowledge of the origin, causes, and in the majority of cases, the needs of these various habits. The radical changes that birds, in most instances make in these particulars under domestication are often more easily explained. That the satisfaction of the sexual instinct and the equally imperative demand, on the part of nature, that the species be perpetuated, if possible, is the essential part of the explanation, there can be no question. No one in any way familiar with general biology, and the past and present life histories of animals on this planet, would for an instant claim that any of these mating habits in birds were of a criminal nature. It is only the

[1] *Loc. cit.* p. 219. The fact of the matter is the so-called birds of paradise differ widely among themselves in structure appearance and in habits; so it may be that some of them are polygamists and others monogamists,— and this is possibly, indeed, probably the case. On the same page as quoted above, Darwin remarks that the male widow-bird, remarkable for his caudal plumes, certainly seems to be a polygamist," and Lydekker in the *Royal Natural History*, quoting Mr. Bowker (p. 366 of Vol. iii), says of the paradise whydahs (Vidua), an African genus of birds the same to which Darwin refers, that one male not unusually mates with at least fifteen females. This species is frequently seen in captivity.

ignorant, the superstitious and narrow-minded who entertain such views. We have plenty of storks, black grouse, and even European cuckoos and American cow-birds among our own species, but the significance of all this, and its biological importance to our kind, I shall endeavor to point out in another connection later on.